Data for Productivity Measurement in Market Services: An International Comparison

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ABSTRACT

With market services accounting for an increasing share of GDP as well as for differences in productivity growth performance across countries, the need for accurate measures of services output is becoming ever more important. In this article we first provide an international comparative perspective on the current state of measurement practices in market services across Europe. Second, we discuss the concrete measurement issues and possibilities for improvement in retail trade and banking. Our comparison of European measurement practices shows that improvements are feasible in many countries and industries without the need for fundamental conceptual research: it mostly requires national statistical agencies to devote additional efforts and resources to this objective. This is exemplified in retail trade, where existing data can be used to yield conceptually superior output measures. But there are other industries for which more research is required. Recent progress on the conceptual challenges to measure bank output suggests new data collection efforts would be needed in most countries to improve measurement of output growth in that industry.

A CRUCIAL QUESTION IN PRODUCTIVITY analysis is whether the data used in the analysis are good enough to support the conclusions drawn from them, or that differences in productivity performance across countries are a statistical artifact due to differences in measurement methods by national statistical institutes. We have recently argued that for many market service industries, output measures in the National Accounts give a fairly accurate — albeit not perfect — internationally comparable picture of developments (Inklaar et *al.*, 2008). There is no doubt that problems in measuring services output still exist, but many statistical offices have made great strides forward in the measurement of the nominal value and prices of services output. Still, progress has been uneven, both across industries and countries. In general, productivity estimates will be biased if nominal outputs, prices, inputs or cost shares are not measured

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correctly (Schreyer, 2001 and Diewert, 2007 and 2008). Griliches (1994) paid particular attention to services sector output as a key source of uncertainty. Indeed, many recent studies look at measurement problems in services, including Wölfl (2003), Triplett and Bosworth (2004; 2008), Crespi, et al. (2006) and Hartwig (2008). Triplett and Bosworth in particular conclude that in the United States, output measurement in services has improved considerably, even as numerous area for further improvement still exist.

This article provides an international comparative perspective on output measurement in market services.[2] The availability of large international databases of industry productivity, like the EU KLEMS database,[3] has made such an assessment of the quality and comparability of the measures of services output for different countries increasingly important. Most measurement problems in market services boil down to the fact that service activities are intangible, more heterogeneous than goods production and often dependent on the actions of the consumer as well as the producer. The measurement of nominal output in market services is generally straightforward, being mostly a matter of accurately registering total revenue. The main bottleneck is the measurement of output volumes, which require accurate price measurement adjusted for changes in the quality of services output.

In this article we first discuss the current state of measurement practices in market services across Europe. We then discuss our research on two of these services industries, namely retail trade and banking.[4] Our overall assessment tends towards a 'glass half full': improvements in measurement practices have been substantial over the years and measurement methodologies have also become more similar. As a result, official statistics should give us a broadly reliable overview of growth trends in market services. Nevertheless, progress is still uneven across Europe and investment in service price measurement is less extensive than in the United States.

This article suggests progress is possible in three ways. First, many countries can improve measurement of services output substantially by adopting best-practice methods already applied in other countries. Second, a more careful application of existing models of production in services such as wholesale and retail trade, but also transport or communications, can be very fruitful and researchers in universities and other organizations may be able to advance this discussion by looking at some of these issues afresh. Finally, in other services industries, like banking, more research is needed to develop a good conceptual framework of production and define the data needs to implement such a framework.

European Measurement Practices

There is no doubt that problems in measuring services output still exist, but today the data situation is much better than, say, two decades ago. In recent years, many statistical offices have made great strides forward in measuring the nominal value and prices of services output, but progress has been uneven, both across industries and countries. Industry differences can be explained by more severe conceptual challenges in some industries than in others. For example, Crespi et al. (2006) argue that measurement problems in the United Kingdom are most severe in finance and business services where output is hardest to define clearly.

2 Non-market services, including government, health and education, are not dealt with here.

3 Seewww.euklems.net. For an overview of EU KLEMS see Timmer, O'Mahony and van Ark (2007).

4 The discussion on measurement practices draws from Appendix 1 of Inklaar, Timmer and van Ark (2008), the discussion on retail trade is based on Inklaar and Timmer (2008) and the discussion on banking is from Basu, Inklaar and Wang (2008), Colangelo and Inklaar (2008) and Inklaar and Wang (2007).

Table 1
Share of Value Added in Market Services in Ten European Countries Deflated using A, B or C-Methods around the Year 2000
(per cent)

ISIC rev. 3 code	Industry	A	B	C
		Average		
50-52	Wholesale and retail trade	0	79	21
52	Retail trade	0	79	21
55	Hotels & restaurants	67	26	7
60-63	Transport & storage	9	67	24
64	Post & telecommunications	9	80	11
65-67	Financial intermediation	0	57	43
65	Banking	0	68	32
71-74	Business services	8	44	48
90-93	Social & personal services	15	44	42
	Market services	10	59	31
		[Minimum-Maximum]		
50-52	Wholesale and retail trade	[0-1]	[0-100]	[0-100]
52	Retail trade	[0-1]	[0-100]	[0-100]
55	Hotels & restaurants	[18-87]	[0-82]	[0-70]
60-63	Transport & storage	[0-34]	[32-100]	[0-60]
64	Post & telecommunications	[0-73]	[27-100]	[0-70]
65-67	Financial intermediation	[0-0]	[0-94]	[6-100]
65	Banking	[0-0]	[0-100]	[0-100]
71-74	Business services	[0-37]	[5-96]	[0-95]
90-93	Social & personal services	[0-48]	[12-93]	[7-89]
	Market services	[3-15]	[12-83]	[5-86]

Notes: Classification into A, B and C-methods are by national statistical offices, based on Eurostat (2001). A-method is defined as most appropriate, B-method as acceptable and C-method as unacceptable. Average share is calculated based on information for Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Sweden and UK. For each country and each industry we use information on the share of value added deflated using A, B or C-methods, and for each industry (as well as the total average) these shares are averaged across countries.

To provide an assessment of statistical practices in European countries, we have made use of a series of recent inventories of volume measurement practices by national statistical institutes (NSIs) in the European Union. These (confidential) inventories were mandated by Eurostat. Using the Eurostat (2001) *Handbook on Price and Volume Measures in National Accounts*, NSIs have graded their volume measurement techniques in each industry as an A, B or C-method. An A-method is considered as most appropriate, a B-method as an acceptable alternative to an A-method, and a C-method as a method that is too biased to be acceptable, or one that is conceptually wrong. For example, for business and management consultancy services, an A-method would be the collection of actual or model contract prices where such prices account for changes in the characteristics of the contracts over time. A typical B-method could be the use of charge-out rates or hourly fees for business services or the price index of a closely-related activity, such as accounting or legal services. A C-method would be any other deflation method, such as using the overall CPI or PPI (Eurostat, 2001:107-108). The main purpose of this taxonomy of measurement practices is to focus attention on the weakest areas of statistics: industries where C-methods are used. For such industries, it is very hard to argue that measured trends would accurately

reflect actual developments in prices and quantities. Data for industries were B-methods are used can be regarded with a somewhat greater degree of confidence, but caution is useful as some bias is still likely. The goal is of course to use A-methods throughout the statistical system.

The inventories by the NSIs referred to above describe the state of measurement practices in each country around the year 2000. Most countries gave explicit grades for each industry and where possible, we cross-checked this grading with the description in the Handbook. Table 1 shows the share of output in each industry that is deflated using A, B and C-methods, averaged across those European countries for which these inventories were available.[5] Since the inventories of measurement practices reflected the situation around the year 2000, it is not known to what extent new practices are also implemented in revisions of historical time series published by the statistical offices or the extent to which subsequent revisions have changed this picture.

The top part of the table shows the average output share (at current prices) and the bottom part shows the range of shares across countries. The table shows that measurement practices in market services are far from perfect since A-methods, with the exception of hotels and restaurants, account for only a small share of output in most industries. It also shows that measurement is most problematic in finance and business services, where nearly half of output is deflated with C-methods. The proportion is similar in social and personal services, but this industry is considerably smaller than the other two. As might be expected, there is also substantial variation in measurement across countries, but this pattern across industries can be observed in most countries. However, it is clear that the scope of measurement problems should not be overstated: only around thirty percent of total market services output is deflated using inappropriate — and hence potentially misleading — methods while for the remainder at least acceptable measures are used.

The bottom part of the table illustrates that differences across countries are very large. For example, there is one country that deflates almost three quarters of output in post and telecommunications using an A-method while there is another country that deflates 70 percent of output using a C-method. The country with the best measurement practices uses C-methods for only 5 percent of market services output, while the country with the worst practices relies on C-methods for 86 percent of output. Luckily, this latter country is one of two outliers, but this suggests that convergence to best measurement practice within Europe would already allow for a more accurate assessment of productivity growth in market services.

This would not so much require additional conceptual work, but more effective adoption of best practices among NSIs (see also Crespi et al., 2006). In most industries, there is no disagreement on what constitute good measurement: surveying prices of well-defined services and ensuring that services with the same or similar characteristics are compared over time.[6] Catching up to best-practice measurement is then mostly a resource issue.

More generally, researchers and other users would benefit substantially from more openness and transparency by NSIs about measurement practices. The unpublished, confidential and infrequent measurement inventories in Europe stand in sharp contrast to easily accessible information published in the *Survey of Current Business* of the US Bureau of Economic Analysis, which regularly reports on updates in the meth-

5 These are still fairly broad industries, hiding some of the heterogeneity within these industries. However, the main differences are across industries.

6 See Swick et *al.* (2006) for a detailed description of services PPIs in the United States.

odologies used in constructing the US National Income and Product Accounts. Publishing these inventories as well as requiring statistical agencies to publish plans for improving measurement would go a long way towards stimulating convergence to best measurement practice.

After this general overview of A, B and C-methods, we look at two industries in detail, namely retail trade and banking. As Table 1 implies, measurement in retail trade is by and large acceptable, while in banking the problems are much more severe. This is also reflected in our own research, where we are able to make an international comparison of productivity growth in retail trade based current and improved statistical methods, while in banking we are limited to comparing methods for the US.

Retail Trade

Productivity growth in the US retail trade industry after 1995 has been rapid, both compared to the earlier years (Triplett and Bosworth, 2004) as well as compared to most European countries (van Ark, Inklaar and McGuckin, 2003). This has led to discussions about the underlying causes, but also raised the question whether or not this is merely a statistical artifact (European Commission, 2004; Gordon, 2004). The key problem is that in current National Accounts methodology, changes in prices of the most important input in retail trade, namely the purchases of goods for resale, are not accounted for.

The failure to account for changes in prices of purchased goods has always been problematic, but is becoming more pressing for two reasons, namely changes in the business models used by retailers and the rapid decline in sales prices of high-tech goods. First, changes in the business models of retailers are changing the demarcation between activities of traders, manufacturers and customers. Triplett and Bosworth (2004) provide a simple example regarding the sale of bicycles, which in the past were delivered to the retailer fully assembled. Today they typically arrive in a box, and customers can choose between having the store arrange for assembly and doing it themselves. Failure to account for differences in purchaser prices can lead to misstated growth rates if certain activities are shifted between stores and suppliers (Triplett and Bosworth 2004; Manser 2005). Second, when sales prices decline rapidly but similar declines in purchases prices are not accounted for, this price decline is mistakingly attributed to the trade services.

Table 2
Real Retail Sales and Margins, 1987-2002
(average annual rate of growth)

	1987-1995		1995-2002	
	Sales	Margins	Sales	Margins
France	2.4	0.1	2.6	-0.2
Germany	2.9	1.5	1.6	2.4
Netherlands	2.3	2.6	1.9	2.2
UK	3.0	6.3	5.2	6.5
US	2.8	3.1	4.5	4.9

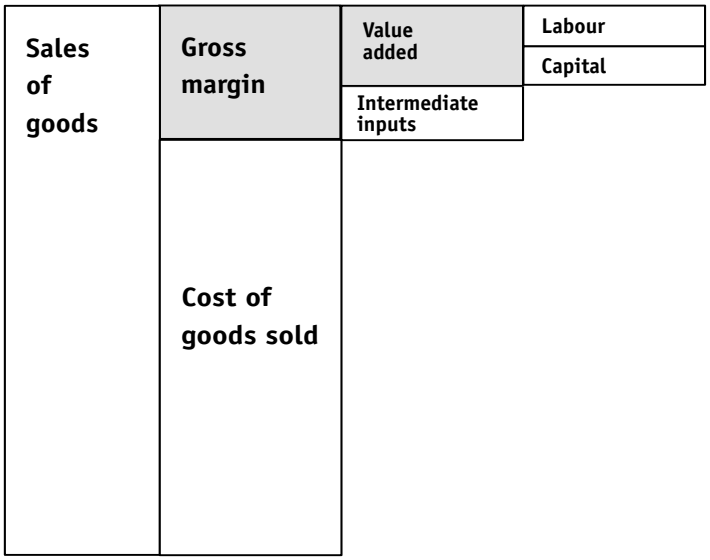
Notes: Germany refers to 1991-1995 instead of 1987-1995.

Source: Inklaar and Timmer (2008, Table 3).

Figure 1 illustrates the different concepts of outputs and inputs in retail trade (and distributive trades more generally). Gross margins, the output concept used in the National Accounts, is only a limited share of sales (around 25 percent) and value added is only a limited share of gross margins (around 60 percent). Measuring these output concepts in current prices is fairly straightforward, but the computation of output volumes poses more problems.[7] As long as prices for all output and all inputs are known, the choice of output measure is inconsequential. This can be illustrated using the example of double-deflated value added. Prices for value added

7 For a more detailed description of the economic model, see Inklaar and Timmer (2008).

Figure 1
Output, Margin, Input and Value Added Concepts in Retail Trade



are not observed directly, but statistical agencies use information on the gross output volumes and intermediate input volumes to implicitly estimate value added volumes. Similarly, given information on sales volumes and volumes of goods purchased for resale, double-deflated margins can be estimated:

1) $$q^S = v^M q^M + \left(1 - v^M\right) q^C ,$$

where q^S is the volume of sales, q^M the volume of margins, q^C the volume of goods purchased for resale and v^M the share of margins in sales. If all variables except q^M are known, q^M can be implicitly calculated. However, volumes of goods purchased for resale are not readily available so statistical agencies by and large use the volume of sales as a proxy for the volume of margins, q^S=q^M. In the Eurostat Handbook (2001), this is described as a B-method.

In Inklaar and Timmer (2008), we use consumption expenditure data and matched consumer and producer prices to estimate the volume of goods purchased for resale, q^C, for France, Germany, the Netherlands, United Kingdom and United States. This would qualify as an A-method as it does not necessitate potentially implausible assumptions. While this is experimental, it does provide some indication of how much this could matter if implemented in official statistics. Table 2 shows average annual growth of real sales and double-deflated real margins. Real sales are currently used as a proxy for real margins, but this table illustrates that the differences between the two measures are substantial in most cases.

While the double deflation method is conceptually preferable, matching consumer and producer prices is difficult in practice and the degree of noise might be substantial. An alternative to this 'macro-level' matching of prices is to directly survey retailers on their purchase and sales prices. In the United States, this method is now applied in measuring a producer price for wholesale and retail trade (see e.g. Manser, 2005).

On the one hand, Table 2 shows that moving from a B-method (real sales as a proxy for real margins) to an A-method (actual real margins) can make quite a difference in the magnitude of output growth. The direction over time can also change: in Germany real sales growth slowed down after 1995 while real margins growth accelerated. However, the cross-country comparison is not strongly affected: countries with high output growth according to the sales proxy, like the United Kingdom and United States, also had comparatively high margin growth.

Banking

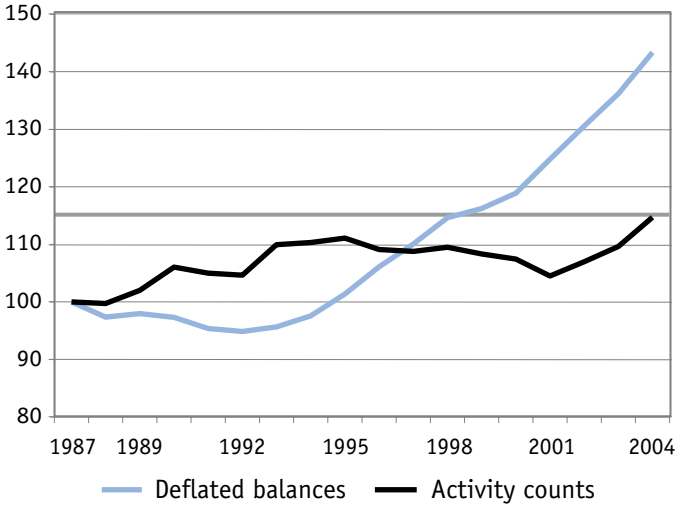
The case of retail trade illustrates the impact of improving the implementation of existing models of industry production. The problem in banking is more fundamental as there is much less agreement on the appropriate measurement model. In a number of ways, banking and retailing are comparable: they are both intermediaries that do not explicitly charge a fee for most of their services. Where retailers buy and resell goods, banks attract and lend money. However,

where in retailing goods are generally bought and sold in a fairly limited period of time, the intertemporal aspect of banking goes to the heart of the business.

Before we can make sensible estimates of output and output growth, we must first establish a coherent framework about the concepts that we aim to measure. The discussion in Triplett and Bosworth (2004) illustrates some of the varying views on measuring bank output, but to outline our preferred model of bank output, we rely on the model of Wang, Basu and Fernald (2004). In this model, banks provide financial services to both depositors and borrowers: depositors obtain ready access to their funds and can make payments while banks determine the credit worthiness of borrowers and monitor them over the duration of the loan. Rather than paying explicitly for these services, depositors forego interest and borrowers pay a higher interest rate relative to a reference rate.

To impute the nominal value of bank output, the key is to choose the right reference rate — the interest rate on a financial instrument with the same risk profile but no services attached. In current statistical practice, this reference rate is taken as the risk-free rate.[8] This is the right choice for deposit accounts, since deposit insurance ensures that a deposit is equivalent to a risk-free investment. In the case of loans though, a comparison should be made to the yield on financial market securities with comparable risk characteristics. This is easiest to illustrate using the hypothetical example of two identical firms, one financed using bonds and the other using bank loans. The output of the bond-financed firm includes all interest payments as part of its operating surplus. However, under current statistical practice output of the bank-financed firm is lower: it is assumed that the firm can borrow at a (short-term) risk-free interest rate and any interest paid to the bank in excess of this rate is treated as purchased financial services.

Chart 1
US Commercial Bank Output Volumes: Deflated Balances vs. Activity Counts, 1987-2004
(1987=100)



In contrast, the model of Wang *et al.* (2004) implies that the bank-financed and bond-financed firm pay the same amount in 'pure' interest, and any excess payments by the bank-financed firm are payments for financial services provided by its bank. Following this logic, the output of a bank from loan L is:

2) $Y^L = \left(r^L - r^M\right)L = \left(r^L - r^P - r^F\right)L$,

where Y is output, r^L is the loan interest rate, r^M is the yield on a comparable market security, r^P is the (systematic) risk premium, r^F is the risk-free rate and L is the loan balance.

This model of bank production implies that output at current prices is currently overstated in the National Accounts. Recent research has shown that this overstatement is quite substantial.[9] Table 3 shows a short summary of their results for the

8 See SNA93 (Inter-Secretariat Working Group on National Accounts, 1993) and Fixler, Reinsdorf and Smith (2003) for the application of this methodology in the US National Income and Product Accounts.

9 See Basu *et al.* (2008) for US evidence and Colangelo and Inklaar (2008) for euro area evidence.

Table 3
The Overstatement of Bank Output at Current prices in the United States and Euro area, 2007-Q3

	Imputed bank output			Overstatment		
	Total	Depositor output	Borrower output	Term premium	Default risk premium	as a % of current imputed output
United States ($bln)	165	85	80	8	82	35
Euro area (€bln)	142	105	38	13	39	27

Sources: United States based on Basu, Inklaar and Wang (2008), Euro area based on Colangelo and Inklaar (2008).

Notes: Depositor and borrower output are estimated by comparing bank interest rates to yields on comparable market securities, in terms of maturity and default risk characteristics. Term premium is the overstatement in current National Accounts from relying on short-term reference rates, rather than matching the maturity of the loans and deposits. Default risk premium only applies to loans and is the overstatement due to the systematic default risk of loans compared to risk-free securities. Imputed output according to current statistical practice includes all four components; the percentage in the last column shows the overstatement from erroneously including the term and default risk premium.

third quarter of 2007. The first three columns show imputed bank output from closely matching bank deposit and loan rates to market securities. The column labeled 'term premium' shows the effect of using a short-term interest rate, as in the current National Accounts, rather than one that takes the maturity of loans and deposits into account. The column labeled 'default risk premium' shows the effect of assuming that all loans are risk-free. The final column shows the share of these two premiums in current bank output. The results for the United States and euro area are broadly comparable: current methods overstate imputed bank output by around a third. This translates into a lower overstatement for total bank output since this consists of imputed bank output and fee income.[10] Moreover, the default risk premium is similar in size to borrower output, substantially reducing the share of total output associated with lending. The term premium is smaller and depends mostly on the shape of the yield curve.

So far the discussion has focused on output at current prices, rather than the output volumes that are important for productivity analysis. Getting output at current prices right is necessary to ensure that any price and volume measures are appropriately weighted. Given the model of bank production above we can now also better discuss the measurement of output volumes.

The implicit pricing of bank output also hampers efforts to measure output volumes. Rather than being able to observe the fee that is charged for a particular loan or a deposit, we only observe the interest flows on broad classes of loans and deposits. The proxy of looking at the trend in loan and asset balances, as suggested by Fixler and Reinsdorf (2006), can be misleading. For example, if the amount of deposits doubles, depositors do not automatically make twice as many withdrawals or wire transfers. Similarly, if the balance of outstanding mortgages increases because of larger average mortgages, this does not necessarily mean that the amount of screening and processing of mortgages has increased by the same amount. This undermines the justification for using loan and deposits balances, deflated by a general price index, as a proxy for real bank output.[11]

The assumption implicit in the above approach is that each dollar of loans or deposits

10 Fee income is around 50 percent in the United States; comparable euro area number are not directly available.

11 See also Basu and Wang (2006) for a formal model that reaches this conclusion.

is associated with the same amount of bank-produced services over time. Alternatively, the amount of services per characteristic-specific loan or per quality-adjusted transaction can be assumed constant over time. From the perspective of what banks do, namely screening and monitoring potential borrowers and performing transactions for depositors, this assumption seems to accord better with our intuition.

Using detailed information on the number of loans and deposit transactions from the BLS, Inklaar and Wang (2007) are able to contrast the output volumes based on the BLS activity counts versus those based on deflated balances. Chart 1 shows the difference between these series for the 1987-2004 period, illustrating that the differences, both in overall growth and the pattern of growth, are very substantial. While deflated balances imply a growth rate of more than 40 percent over this period, activity counts suggest a rate of only 15 per cent. Unfortunately, the data required for such a comparison are not available outside the United States, so an international comparison of the alternative measures is not feasible.

In short, we have argued that an index of *quality-adjusted* activity counts is theoretical a more sensible measure of real bank output. In practice, however, the implicit pricing of many bank services has often necessitated the use of proxies, such as deflated asset balances. We would advocate that a more appealing solution going forward is to collect more activity data instead.

Conclusions

National Accounts were first developed in an academic setting. Yet, there is an important role for interactions between statisticians and researchers in universities and organizations like the OECD in improving our insight into the economy in general and specifically into productivity. Demands by policy makers for high quality data and skepticism about the role of measurement practices in explaining cross-country growth differences suggest a continued emphasis on the need to improve the quality of statistics on both output and inputs. Measurement of output in market services has received considerable attention in recent years and this article has provided an international perspective on differences in measurement practices and how such differences can affect our view of growth across Europe and the United States.

Using a set of measurement inventories for European countries, we have given a summary overview of the quality of measurement practices in services industries. This has shown that in many industries, statistical offices across Europe use methods for estimating real services output that should reflect true developments in the industry to a reasonable degree. An example is the use of growth in real retail sales as a proxy for growth in real margins. Some industries are notoriously hard to measure, such as finance and business services and most other industries, where acceptable rather than preferable methods are the norm. This is in line with the UK overview by Crespi et *al.* (2006).

However, the differences across Europe are large. While acceptable measures are used to estimate on average 60 percent of market services output, this is only 12 percent in the country with the least sophisticated methods. The remainder of output is estimated by, for example, deflating nominal sales by a general price index like the CPI — a method that omits information crucial for productivity analysis. This points to the first way of improving overall data quality in market services: by adopting best-practice methods, countries can usually improve the quality of their data substantially. Such improvements obviously require investment in statistical expertise and data collection, but the experience of European countries with more sophisticated measurement practices suggests that resource requirements are not prohibitive.

Measurement inventories are a very useful first step to stimulate convergence to best-practice measurement. Publication of these inventories and the development of roadmaps for improving measurement in specific ways in specific industries would be a useful subsequent step.

This overview of measurement practices is still fairly qualitative and not well suited to determine how growth performance would change in individual countries if measurement practices were improved. The question how the overall comparative picture on growth would change in Europe relative to the United States is an even more challenging one.

To push out the measurement frontier, more applied and conceptual research is needed. The case of retail trade demonstrated that existing models of production in services can be applied better and lead to differences in outcomes. It has shown that current statistical practices do not systematically overstate growth in countries with rapid productivity growth like the United Kingdom or United States but also that the specifics of the European and US growth experience change with improved measurement. The case of banking showed that this is not always sufficient: if an appropriate conceptual model of industry production is missing, measurement is based on quicksand. Theoretical work is then needed to provide a firm foundation for applied research and implementation of more insightful measures of services output.

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